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Instructions for use

# Tetranychoid Mites of Mulberry in Japan<sup>1,2)</sup>

By

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(With 32 Text-figures)

There are known hitherto in Japan five species of tetranychid mites parasitic on mulberry (Kishida, 1927, Yokoyama, 1929, 1932, Yokoyama & Ishii, 1934, Ehara, 1956). Most of these species remain, however, acarologically still in question, because of insufficient descriptions of them. In the present taxonomical study of the tetranychoid mites, Yokoyama's type specimens preserved in the National Sericultural Experiment Station, Tokyo, were used, together with collections made by other gentlemen and the author himself. The following is the list of the species here treated :

## Family Tetranychidae

1. *Panonychus citri* (McGregor)
2. *Eotetranychus suginamensis* (Yokoyama)
3. *Tacebia parva* Yokoyama
4. *Tetranychus kanzawai* Kishida
5. *Tetranychus telarius* (Linné)
6. *Tetranychus truncatus* n. sp.

## Family Phytoptipalpidae

7. *Brevipalpus inornatus* (Banks)

Before going further, the author is much obliged to Professor Tohru Uchida for his helpful guidance. Furthermore, he wishes to acknowledge his indebtedness to Dr. Zyuiti Kuwana in allowing the loan of Yokoyama's type specimens of his laboratory, and he is further indebted to Messrs. Shizuo Kato, Mitsuo Obi, Gorô Ishii, Yoshimasa Hasegawa and Norizumi Shinkaji, and other gentlemen who kindly helped him in collecting material. Thanks are also due to Prof. Teiso Esaki, Dr. H. B. Boudreaux, Messrs. Jinhaku Minami-kawa, Kyukichi Kishida and Haruo Takashima for their valuable suggestions.

## Family TETRANYCHIDAE

### Genus *Panonychus* Yokoyama

*Panonychus* Kishida : Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 531, 1929. Genotype : *Panonychus mori* Yokoyama, 1929 (monobasic) = *Tetranychus citri* McGregor, 1916.

1) Contribution No. 367 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Aided by a grant from the Scientific Research Fund of the Hokkaido Prefectural Office (1956).

*Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 12, 1956.*

*Metatetranychus* Oudemans, Ent. Ber., 8: 199, 1931. Genotype: *Tetranychus ulmi* Koch, 1836; by original designation. **n. syn.**

Yokoyama gave only the description of *P. mori*, without the diagnosis of the genus *Panonychus*, but *Panonychus* is a valid name, in accordance with the International Rules of Zoological Nomenclature.<sup>1)</sup>

Recently, Pritchard and Baker (1955) considered the genus *Panonychus* to be a synonym of *Oligonychus* (= *Paratetranychus*). However, as is confirmed here, *Panonychus* has the priority over *Metatetranychus*.<sup>2)</sup>

***Panonychus citri* (McGregor), n. comb.**

*Tetranychus citri* McGregor, Ann. Ent. Soc. Amer., 9: 286, pl. 14, figs. 1-9, 1916.

*Panonychus mori* Kishida: Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 531, figs. 243, 244, 1929 (♀ ♂, on mulberry); ———, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 311, figs. 114, 115, 1933; Yokoyama & Ishii, Bull. Imp. Seric. Exp. Sta., 8: 425, pl. 32, 1934; Zacher, Handb. Pflanzenkrankh., Bd. 4, Lief. 1, 5 Aufl., p. 164, 1950. **n. syn.**

*Panonychus mori* Kishida (nomen nudum): Hujiyama, Sakura-kai Zasshi, No. 22, p. 85, 1927.

*Oligonychus mori*, Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 341, 1955.

*Metatetranychus citri*, Reck, Soobsh. Akad. Nauk Gruz., S. S. R., 2(9), p. 832, 1941; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 133, figs. 96-99, 1955; Ehara, Annot. Zool. Jap., 28: 180, figs. 9-11, 1955.

On the present species the author recently gave a rather detailed note under the name of *Metatetranychus citri*. The syntypes of *Panonychus mori* Yokoyama<sup>3)</sup> have been available for the present study. After examination, it has been clear that *Panonychus mori* is synonymous with *Metatetranychus citri*.

The mite is here recorded firstly from Hokkaido. On the eggs from Hokkaido the gey fibrils are generally absent.

*Specimens examined.* Together with the syntypes of *mori*, additional specimens labelled by Yokoyama as *mori* have been studied. Furthermore, the following collections from mulberry have been studied: *Hokkaido*: Sapporo, 3 ♂♂ & 10 ♀♀, 21. VIII, 1953, 25 ♀♀, 12. VIII, 1954, 3 ♂♂ & 30 ♀♀, 3. VII, 1956, S. Ehara leg.; *Honshu*: Iizaka, Fukushima Pref., 4 ♀♀, 10. X, 1955,

1) Article 25: An Unofficial Interpretation of the International Rules of Zoological Nomenclature as amended by the XIII International Congress of Zoology, Paris, 1948, and by the XIV International Congress of Zoology, Copenhagen, 1953 (by W. I. Follett, 1955), p. 26, (138), A & B, p. 33, (169).

2) Accordingly, the name of European red mite, *Metatetranychus ulmi* (Koch), should be changed:

*Panonychus ulmi* (Koch), **n. comb.**

3) As is pointed out by Pritchard and Baker (1955) the name *Panonychus mori* is validated by Yokoyama, who first published the description of *mori*. Although Yokoyama as well as a number of other Japanese writers credited this species to Kishida, no description of *mori* by Kishida has been published.

S. Ehara leg.; Maébashî, Gumma Pref., 5 ♀♀, 5. X, 1955, 10 ♀♀, 6. X, 1955 (staffs of the Gumma Pref. Sericult. Exp. Sta.); Sôja, Gumma Pref., 10 ♀♀, 6. X, 1955 (staffs of the Gumma Pref. Sericult. Exp. Sta.); Shibukawa, Gumma Pref., 1 ♀, 15. X, 1955, S. Ehara leg.; Manriki, Yamanashi, Yamanashi Pref., 1 ♀, 13. X, 1955, S. Ehara leg.; Kyushu; Kasugabarû, Fukuoka Pref., 3 ♂♂ & 10 ♀♀, 22. X, 1955, S. Ehara leg., 10 ♀♀, 26. X, 1955, M. Ono leg.

***Eotetranychus suginamensis* (Yokoyama)**

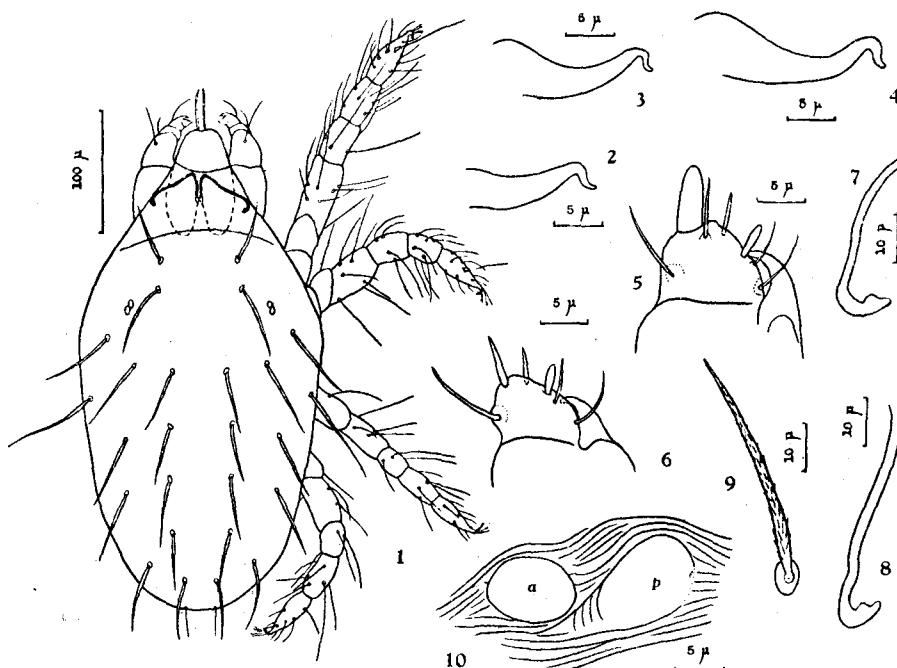
(Figs. 1-14)

*Tetranychus suginamensis* Yokoyama, Bull. Imp. Seric. Exp. Sta., 8: 231, pls. 23, 24, 1932 (♀ ♂, on mulberry).

*Tetranychus* sp., Yokoyama, New Textb. Sericult. Ins. Pests (Saishin Nippon Sangyô Gaichû Zensho), p. 538, fig. 247, 1929; Suematsu & Yokoyama, Textb. Mulberry Pests (Sôju Byôgaichû Ron), p. 180, fig. 65, 1930.

*Tetranychus Suginamensis* (!), Yokoyama, Vadem. Sericult. Ins. Pests (Jitsuyô Sangyô Gaichû Hen), p. 315, figs. 116, 117, 1933.

*Eotetranychus suginamensis*, Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 200, 1955.



Figs. 1-10. *Eotetranychus suginamensis*. 1. Dorsal view of female. 2-4. Aedeagus. 5. Distal part of palpus of female. 6. Distal part of palpus of male. 7-8. Peritreme of female, dorsal view. 9. Dorsal seta of female. 10. Eyes of female, left side; a, anterior eye, p, posterior eye.

*Female.* Body from above elliptical, 310 to 390  $\mu$  long and 190 to 230  $\mu$  wide in widest part. Colour pale greenish yellow. Distal segment of palpus wider than long; 5 additional setae present as usual; terminal sensillum more than two and one-half times as long as broad; dorsal sensillum rather spindle-shaped, distinctly shorter than terminal sensillum. Mandibular plate (ratio of length to breadth, 10:6.3), emarginate mediodistally. Relative lengths of segments in leg I as follows: Trochanter, 11; femur, 21; patella, 12; tibia, 12; tarsus (empodium exclusive), 16. Tarsus I dorsally provided with 2 proximate sets of duplex setae, 5 tactile setae borne proximad of proximal set of duplex setae; proximal duplex setae of tarsus I with proximal member about one-third as long as distal member; distal duplex setae of tarsus I with proximal member one-fifth to one-fourth as long as distal member; tibia I with 9 tactile and 1 sensory setae. Tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae; tibia II with 8 tactile setae. Empodia normally consisting of 3 pairs of hairs. Two eyes present on each side, anterior eye being smaller than posterior one. Peritreme rather slender, hooked distally and ending in unique form, as shown in Figs. 7-8. Dorsum of body with transverse striae not only between the inner sacral and inner lumbar setae, but also in the area between these setae. Dorsal setae not arising from tubercles, comparatively rapidly tapering, pubescent, and generally longer but sometimes shorter than longitudinal intervals between them. Genital flap generally with transverse striae; the area immediately anterior to the flap variable in striation individually, sometimes transversely striate, and sometimes irregularly striate.

*Male.* Body from above sagittate in outline, 210 to 250  $\mu$  long and 130 to 150  $\mu$  wide in widest part. Distal segment of palpus without terminal sensillum; dorsal sensillum spindle-shaped. Tarsus I with 4 tactile and 2 sensory setae posterior to duplex setae; tibia I with 9 tactile and 4 sensory setae. Tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae; tibia II with 8 tactile setae. The aedeagus is as given in Figs. 2-4: Shaft gradually tapering posteriorly and bent sharply ventrad in posterior portion to form the hook which is much shorter than shaft, and which is gradually narrowing and sigmoid.

*Specimens examined.* In this study the syntypes have been examined. These were collected at Suginami, Tokyo, and are composed of both sexes. Together with the types, the following specimens collected on mulberry, including topotype material, have been studied: *Hokkaido*; Maruyama, Sapporo, 2 ♂♂ & 4 ♀♀, 9. IX, 1955, S. Ehara leg.; *Honshu*; Yanagawa, Fukushima Pref., 2 ♀♀, 25. IX, 1955, O. Amano leg.; Iizaka, Fukushima Pref., 5 ♂♂ & 30 ♀♀, 10. X, 1955, S. Ehara leg.; Numata, Gumma Pref., 3 ♀♀, 15. X, 1955, S. Ehara leg.; Suginami, Tokyo, 1 ♂ & 2 ♀♀, 12. X, 1954, G. Ishii & S. Ehara leg.; Manriki, Yamanashi, Yamanashi Pref., 2 ♂♂ & 2 ♀♀, 13. X, 1955, S. Ehara leg.

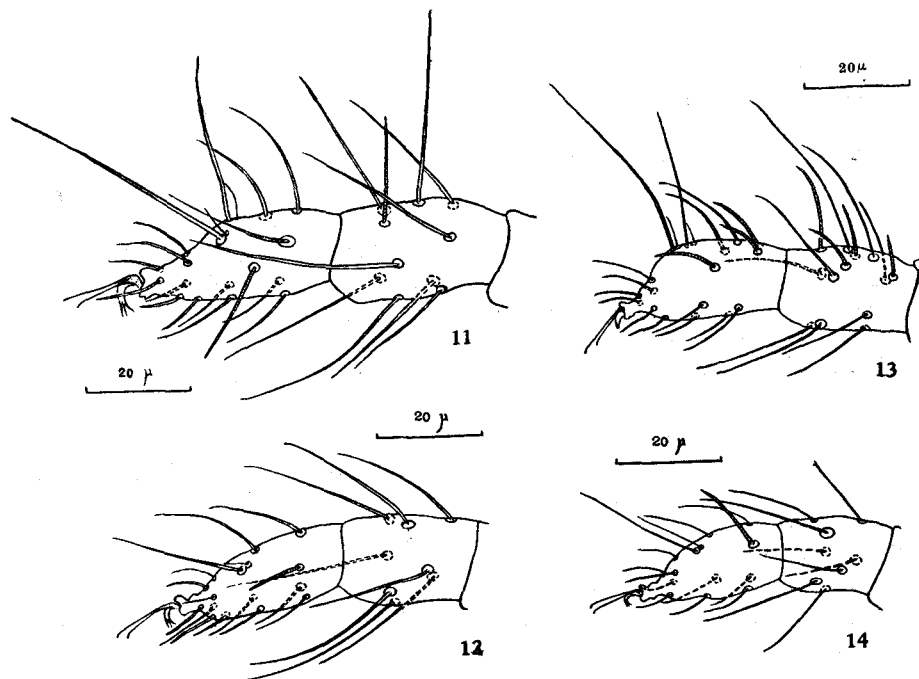
Specimens from *Quercus serrata* (new host) in Honshu have been forwarded

to the author by Mr. Naoshi Hikichi: Noda-mura, Fukushima Pref., 3 ♂♂ & 10 ♀♀, 10. VIII, 1955, N. Hikichi leg.

*Hosts.* Mulberry and *Quercus serrata*.

*Distribution.* Japan: Hokkaido (*new record*) and Honshu.

*Remarks.* The mite originally described as *Tetranychus suginamensis* was transferred by Pritchard and Baker (1955) into the genus *Eotetranychus*, their treatment being based on a few biological habits shown in Yokoyama's description. The present author is coincided with them.



Figs. 11-14. *Eotetranychus suginamensis*, chaetotaxy of leg. 11. Tibia and tarsus I of female. 12. Tibia and tarsus II of female. 13. Tibia and tarsus I of male. 14. Tibia and tarsus II of male.

This species closely resembles *Eotetranychus pallidus* (Garman, 1940) and *E. hicoriae* (McGregor, 1950) of U.S.A. in the structure of aedeagus, but its male palpus is deficient in terminal sensillum. Furthermore, this is characterized in the structure of peritreme. Pritchard and Baker (1955) are of opinion that *Eotetranychus mori* (Rahman and Sapra, 1940) of India is synonymous with *E. suginamensis*. But, *E. mori* is probably a distinct species, as the terminal sensillum of male palpus is well developed in *E. mori* (after original) but absent in *E. suginamensis*.

### Genus *Tacebia* Yokoyama

*Tacebia* Kishida: Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 536, 1929. Genotype: *Tacebia parva* Yokoyama, 1929; monobasic.

The genus *Tacebia* is validated by the description of the species, *T. parva*, though Yokoyama did not give the diagnosis of the genus. Pritchard and Baker (1955) considered the genus *Tacebia* to be a synonym of the genus *Oligonychus* (= *Paratetranychus*). The true status of *Tacebia* must remain in question before the genotype, *T. parva*, is critically studied.

### *Tacebia parva* Yokoyama

*Tacebia parva* Kishida: Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 536, 1929 (♀, on mulberry).

*Tacebia Parva* (!) Kishida (nomen nudum): Huijiyama, Sakura-kai Zasshi, No. 22, p. 85, 1927.

*Oligonychus parva*, Pritchard & Baker, *Rev. Spider Mite Fam. Tetr.*, p. 341, 1955.

On this species, Pritchard and Baker (1955) stated as follows: "Yokoyama validated this species, even though it was credited to Kishida. No reference to publication of the name by Kishida has been found." The present author is of the same opinion with them.

Yokoyama's types were lost unfortunately. Two eggs of this species labelled by Yokoyama are preserved in the National Sericultural Experiment Station. These eggs, attaining about 160  $\mu$  in diameter, seem to belong to the Tetranychidae. The eggs are preserved in poor condition, so that it has been unable to observe whether they possess the dorsal stipe or not.

The mite was sought by the present author in the type locality (Fukushima Prefecture) in autumn of 1955, but was not succeeded. According to Yokoyama's description, females of *Tacebia parva* are bright red in colour, and their legs terminally bear two strong claws. The true status of this species is preserved for further study.

### *Tetranychus kanzawai* Kishida

(Figs. 15-25)

*Tetranychus kanzawai* Kishida, *Zool. Mag.*, 39: 105, 1927 (♀ ♂, on mulberry); —, *Illustr. Encycl. Fauna Jap.*, p. 957, fig. 2724, 1947; anonymous, *Kanzawa Spider Mite & its Control* (Kanzawa-hadani to sono Bôjohô), p. 2, pls. 1, 2, 3, 1927; Yago, *Control Method Agr. Ins. Pests* (Zikken Gaichû Bôjohô), p. 375, fig. 166, 1935; Ishii, *Textb. Agr. Ent.*, p. 345, 1949; Pritchard & Baker, *Rev. Spider Mite Fam. Tetr.*, p. 431, 1955.

*Tetranychus kanzawai* (partim), Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 525, fig. 241, 1929.

*Tetranychus Kanzawai* (!) (partim), Suematsu & Yokoyama, *Textb. Mulberry Pests* (Sôju Byôgaichû Ron), p. 178, fig. 64, 1930; Yokoyama, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 307, figs. 111, 112, 1933.

*Tetranychus japonicus* Hotta, *Trans. Shizuoka-ken Agr. Assoc.*, 32: 10, 1928 (♀ ♂); Minamikawa, *Chagyô Gijutsu Kenkyû*, No. 3, p. 50, 1950; —, *Vadem. Tea Cult.* (Chagyô Hôten), p. 123, fig. 20, 1950. **n. syn.**

*Tetranychus japonica* (!), Sonan, *Ins. World*, 37: 263, 1933.

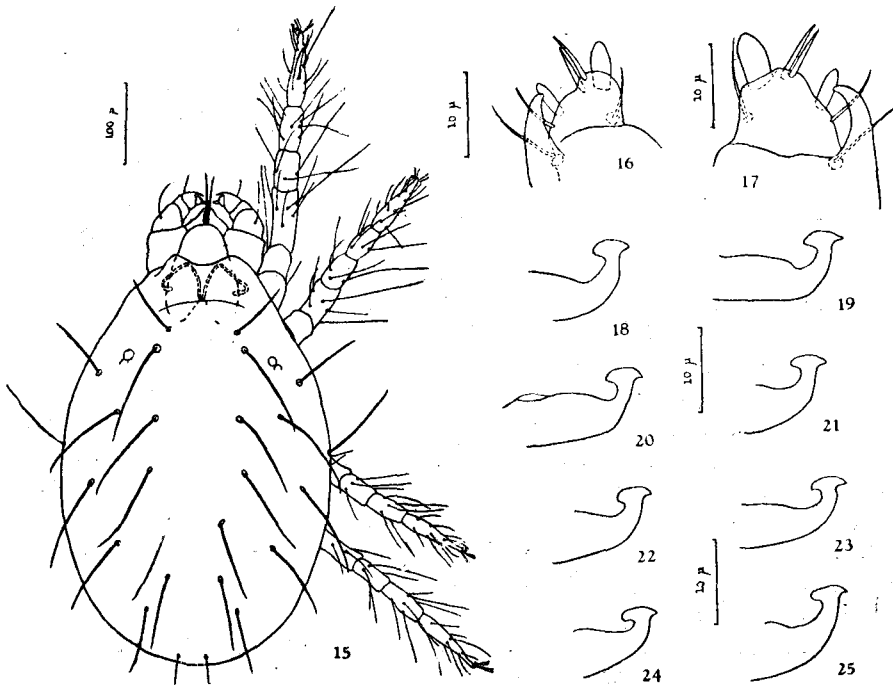
*Tetranychus* sp., Hotta, *Chaji-Shiken Tokubetsu Hôkoku*, No. 2, p. 2, pl. 1, 1917.

*Tetranychus telarius* (nec Linné), anonymous, *Ann. Rep. Shizuoka-ken Agr. Exp. Sta.*, 1918: 115, 1918; —, *Life History & Control Tea Spider Mite & Citrus Spider Mite* (Cha no Akadani to Mikan no Akadani tonô Keika-Shûsei narabini sono Kujohô; publ. by Shizuoka-ken Agr. Exp. Sta.), p. 1, pl. 1 (figs. 1-3), 1924; Esaki, *Myriapoda & Arachnida*, p. 74, 1932; Yago, *Control Method Agr. Ins. Pests* (Zikken Gaichû Bôjohô), p. 375, 1935.

*Tetoranychus* (!) *telarius* (nec Linné), Hotta, *Ins. Pests Tea Plant* (Chaju no Gaichû; mimeographed), p. 131, 2 figs., 1920.

*Tetranychust* (!) *clarius* (!), anonymous, *J. Plant. Protect.*, 12: 468, 1925.

This species was originally described based on specimens collected on mulberry in Yamanashi Prefecture. A number of specimens collected from type locality have been available for the present study.



Figs. 15-25. *Tetranychus kanzawai*. 15. Dorsal view of female. 16. Distal part of palpus of male. 17. Distal part of palpus of female. 18-25. Aedeagus (18-21, Yamanashi Pref., on mulberry; 22-25, Shizuoka Pref., on tea).



The mite is carmine red in colour. The female measures  $400\ \mu$  long and  $290\ \mu$  wide, while the male measures  $290\ \mu$  long and  $180\ \mu$  wide. The chaetotaxy of legs is as follows: Female; tarsus I with 4 tactile setae posterior to duplex setae, tibia I with 9 tactile and 1 sensory setae, tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae, tibia II with 7 tactile setae; male; tarsus I with 4 tactile and 2 sensory setae proximal to duplex setae, tibia I with 9 tactile and 4 sensory setae, tarsus II with 3 tactile and 1 sensory setae posterior to duplex setae, tibia II with 7 tactile setae.

*T. kanzawai* closely resembles *T. telarius*, but is different from the latter in the structure of aedeagus. The aedeagal barb of the former is much larger than that of the latter, and is acutely angled posteriorly but rounded anteriorly. Furthermore, the dorsal integumentary folds of the female bear semi-circular to triangularly rounded lobes, showing the type of *T. cinnabarinus* and *T. lobosus*, rather than that of *T. telarius* and *T. atlanticus* (Boudreaux, 1956).

Collating the present species, topotype material of *T. japonicus* Hotta, 1928, which was originally described from Kanaya, Shizuoka Pref., on tea, has been studied. Consequently, it has been clear that *T. japonicus* is a synonym of *T. kanzawai*. A mite recently recorded from apple in Shizuoka Prefecture under the name of *T. atlanticus* (Shinkaji, 1954, Pritchard & Baker, 1955) seems probably to be identical with the mite here treated.

*Specimens examined.* The following specimens collected on mulberry have been studied: *Hokkaido*; Maruyama, Sapporo, 1 ♂, 20. IX, 1955, S. Ehara leg.; *Honshu*; Iizaka, Fukushima Pref., 3 ♂♂ & 5 ♀♀, 10. X, 1955, S. Ehara leg.; Suginami, Tokyo, 1 ♂ & 6 ♀♀, VI, 1956, 3 ♂♂ & 5 ♀♀, VII, 1956, G. Ishii leg.; Shiozaki, Yamanashi Pref., 1 ♂ & 5 ♀♀, 13. X, 1955, S. Ehara leg.; Manriki, Yamanashi Pref., 5 ♂♂ & 15 ♀♀, 13. X, 1955, S. Ehara leg., 1 ♂ & 13 ♀♀, 18. XI, 1955, T. Tsuchiya leg.

Collections from other hosts in Honshu are as follows: Kuroishi, Aomori Pref., 5 ♂♂ & 3 ♀♀ (on pseudacacia), 25. VIII, 1954, S. Ehara leg.; Nirazaki, Yamanashi Pref., 4 ♂♂ & 15 ♀♀ (on hop), 13. X, 1955, S. Kato & S. Ehara leg.; Kanaya, Shizuoka Pref., 10 ♂♂ & 30 ♀♀ (on tea), 25. X, 1954, J. Minamikawa & M. Osakabe leg., 6 ♂♂ & 12 ♀♀ (on tea), XI, 1955, M. Osakabe leg., 3 ♀♀ (on tea), 14. X, 1954, S. Ehara leg.; Tsudaka-mura, Okayama Pref., 2 ♂♂ & 9 ♀♀ (on grape in greenhouse), 2. IX, 1955, S. Yabuki leg.; Nagaoka, Okayama, 4 ♂♂ & 6 ♀♀ (on pear), 2. IX, 1955, S. Yabuki leg.; Nagao-machi, Okayama Pref., 1 ♂ & 2 ♀♀ (on peach), 2. VIII, 1955, S. Yabuki leg.

*Hosts.* Hosts authentically recorded from Japan are mulberry, tea, hop, grape, pseudacacia, pear, peach and apple. This species is found predominantly on mulberry trees in Yamanashi Prefecture. It is a serious pest of tea in eastern part of Shizuoka Prefecture.

Hotta (1928) enumerated various kinds of host plants of *T. japonicus*. The present author, however, is doubtful about the fact that Hotta treated only speci-

mens belonging to the single species. In short, the author is inclined to consider that the tea is only authentic among the hosts listed by Hotta.

*Distribution.* Japan: Hokkaido (*new record*) and Honshu.

### ***Tetranychus telarius* (Linné)**

(Figs. 26-27)

*Acarus telarius* Linné, Syst. Nat., Ed. 10, p. 616, 1758.

*Tetranychus telarius*, Dugés, Ann. Sci. Nat. Paris (sér. 2), 1: 15, 1834; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 433, figs. 386-391, pl. 1, 1955; Ehara, J. Fac. Sci. Hokkaido Univ., Ser. VI, Zool., 12: 249, figs. 11-15, 1956.

*Tetranychus lintelarius* (!), Kishida, Illustr. Encycl. Fauna Jap., 1st Ed., p. 977, fig. 1818, 1927; ———, Ibid., Rev. Ed., p. 957, fig. 2723, 1947.

The author described the species rather in detail in his previous report (1956). A number of specimens from mulberry in Hokkaido and Honshu (Gumma Pref. and Ibaragi Pref.) have been studied. Specimens from the hop (belonging to the Moraceae as well as mulberry) in Hokkaido and Honshu (Yamagata Pref.) have been also studied.

### ***Tetranychus truncatus* n. sp.**

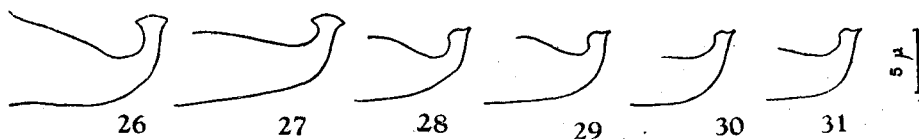
(Figs. 28-31)

*Tetranychus kanzawai* (partim; nec Kishida), Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 525, fig. 241, 1929.

*Tetranychus Kanzawai* (!) (partim; nec Kishida), Suematsu & Yokoyama, *Textb. Mulberry Pests* (Sôju Byôgaichû Ron), p. 178, fig. 64, 1930; Yokoyama, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 307, figs. 111, 112, 1933.

The present mite is carmine in colour. The female measures 400  $\mu$  long and 290  $\mu$  wide, while the male measures 290  $\mu$  long and 180  $\mu$  wide.

This species belongs to the *telarius* complex, and is generally in accordance in structure with the members belonging to the complex, but is different from the rest in the aedeagus with a tiny barb, of which the hook is apparently truncated. The barb is acutely angled posteriorly but rounded anteriorly, the axis of the barb forming a small angle with the shaft.



Figs. 26-27. Aedeagus of *Tetranychus telarius*. Figs. 28-31. Aedeagus of *Tetranychus truncatus* n. sp.

The dorsal integumentary folds of the female bear semi-oblong to semicircular lobes, showing the type of *T. telarius*, rather than that of *T. cinnabarinus* and

*T. lobosus* (Boudreaux, 1956).

The mites described by Yokoyama under the name of *T. kanzawai* seem partly to belong to the new species. Because, his studies were chiefly based on specimens from Suginami, Tokyo, where both *kanzawai* and the closely related species occur on the mulberry.

Holotype. ♂, Suginami, Tokyo, 12. X, 1954 (on mulberry), G. Ishii & S. Ehara leg.

Allotype. ♀, same data as holotype.

Paratypes. 5 ♂♂ & 7 ♀♀, same data as holotype.

The types are preserved in the Zoological Institute, Faculty of Science, Hokkaido University.

Several specimens from Shibukawa, Gumma Pref., on mulberry, seem to be identical with the new species, though the specimens are few in number.

*Host and distribution.* Japan: Honshu, on mulberry.

#### Family PHYTOPTIPALPIDAE

##### *Brevipalpus inornatus* (Banks)

(Fig. 32)

*Tenuipalpus inornatus* Banks, Proc. Ent. Soc. Wash., 14: 97, pl. 1, fig. 1, 1912.

*Brevipalpus inornatus*, Baker, Proc. Ent. Soc. Wash., 47: 33, 1945; ———, Amer. Midl. Nat., 42: 358, pl. 2, figs. 11–15, 1949; McGregor, Mem. S. Calif. Acad. Sci., 3: 13, fig. 4, pl. 2, 1949; Pritchard & Baker, Univ. Calif. Publ. Ent., 9: 36, fig. 37, 1952; Minamikawa, Cha, 8 (1): 27, 1955.

? *Tenuipalpus californicus*? (nec Banks), Hotta, Ins. Pests Tea Plant (Chaju no Gaichū; mimeographed), p. 136, 1 fig., 1920.

? *Tenuipalpus* sp., Sonan, Ins. World, 37: 263, 1933.

*Female.* Body from above ovate-sagittate, about 250  $\mu$  long (including rostral shield), widest (160  $\mu$ ) at suture between propodosoma and hysterosoma. Colour scarlet. Rostrum about reaching the middle of femur I. Palpus slightly surpassing the rostrum, with two setae and a peg on the distal segment. Mandibular plate sagittate anteriorly. Tarsi I and II each with a rodlike seta; femora I and II each with a broad, serrate dorsal seta. Peritreme ending in a swollen chamber. Rostral shield with three pairs of lobes, deeply cleft between two median lobes. Dorsum of both propodosoma and hysterosoma with weak, apparently inconspicuous, irregular striae medially, though considerably variable interspecifically, and with rather even reticulations mediolaterally; elements of the reticulate pattern generally polygonal. Hysterosomal pores rather inconspicuous. All dorsal setae short; dorsolateral hysterosomal setae five-paired, serrate, last three pairs comparatively well developed; dorsocentral hysterosomal setae three-paired, minute. Venter of body mostly with small reticulations. Anterior medioventral metapodosomal pair much shorter than posterior pair, the latter reaching to the suture between propodosoma and hysterosoma.

*Male.* Body from above sagittate, about  $230\ \mu$  long (including rostral shield) and  $150\ \mu$  wide. Generally similar to female. Tarsi I and II with a rodlike seta respectively. The dorsal integument is different from the female in the following points: Anterior part of hysterosoma inconspicuously reticulate medially, posterior part of hysterosoma reticulate in both median and mediolateral portions.

*Deutonymph.* Body subequal in size to male. The dorsal propodosomal, humeral, and dorsolateral hysterosomal setae are all observable to be serrate. Second and third pairs of dorsal propodosomals broad and large, last three pairs of dorsolateral hysterosomals similar to these setae; dorsocentral hysterosomals minute.

*Specimens examined.* Honshu: Iizaka, Fukushima Pref., 4 ♂♂, 13 ♀♀ & 2 nymphs (on mulberry), 10. X, 1955, S. Ehara leg., 3 ♀♀ & 1 nymph (on *Erigeron* sp.), 13. V, 1955, N. Hikichi leg.; Shibukawa, Gumma Pref., 5 ♀♀ (on mulberry), 15. X, 1955, S. Ehara leg.; Matsudo, Chiba Pref., 10 ♀♀ & 1 nymph (on tea), 31. X, 1955, S. Ehara leg.; Shimizu, Shizuoka Pref., 5 ♀♀ & 1 nymph (bred in Labor., Ihara Noyaku Co., Ltd., furnished by Y. Hasegawa; natural and laboratorial host, tea), III, 1955 (this date: taken from culture and fixed). Kyushu: Kagoshima, 3 ♀♀ & 2 nymphs (on tea), 26. X, 1955, S. Ehara & H. Maehara leg.

*Hosts.* Tea, mulberry, *Erigeron* sp., *Pittosporum*, and tulip bulbs are known as hosts of the mite in Japan. Records from the last two hosts were made in U.S.A., and the recorded specimens were imported from Japan after American authors (Baker, 1949, Pritchard & Baker, 1952). From U.S.A. and other countries various kinds of host plants, mostly ornamental plants, were recorded.

*Distribution.* Japan (Honshu; Kyushu, *new record*); Argentina, Australia,

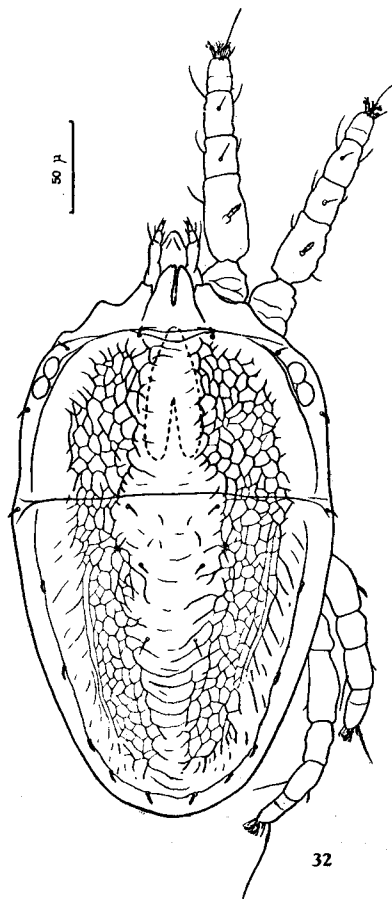


Fig. 32. *Brevipalpus inornatus*, dorsal view of female.

Canada, Ceylon?, Italy (at U.S.A. port), U.S.A., Venezuela.

*Remarks.* A false spider mite which was reported twice at least to infest Japanese tea-plants, is perhaps the present species (cf. synonymic list shown above). The authentic record from tea of Japan was first made by Minamikawa (1955). The mite has been recognized to be parasitic on mulberry as well as on tea in Japan, both of them being of economic importance in this country.

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- 1932. New tetranychid mites attacking the mulberry leaf. Contribution I. Bionomics and external structures of the *Tetranychus suginamensis* n. sp. (In Japanese with English résumé) Bull. Imp. Sericult. Exp. Sta. (Tokyo), 8: 229-287, 2 pls.
- & G. Ishii 1934. Tetranychid mites attacking the mulberry leaf. Contribution II. External structures and bionomics of *Panonychus mori* Kishida. (In Japanese with English résumé) Bull. Imp. Sericult. Exp. Sta. (Tokyo), 8: 425-454, 1 pl.

# Tetranychoid Mites of Mulberry in Japan<sup>1,2)</sup>

By

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(With 32 Text-figures)

There are known hitherto in Japan five species of tetranychid mites parasitic on mulberry (Kishida, 1927, Yokoyama, 1929, 1932, Yokoyama & Ishii, 1934, Ehara, 1956). Most of these species remain, however, acarologically still in question, because of insufficient descriptions of them. In the present taxonomical study of the tetranychoid mites, Yokoyama's type specimens preserved in the National Sericultural Experiment Station, Tokyo, were used, together with collections made by other gentlemen and the author himself. The following is the list of the species here treated :

## Family Tetranychidae

1. *Panonychus citri* (McGregor)
2. *Eotetranychus suginamensis* (Yokoyama)
3. *Tacebia parva* Yokoyama
4. *Tetranychus kanzawai* Kishida
5. *Tetranychus telarius* (Linné)
6. *Tetranychus truncatus* n. sp.

## Family Phytoptipalpidae

7. *Brevipalpus inornatus* (Banks)

Before going further, the author is much obliged to Professor Tohru Uchida for his helpful guidance. Furthermore, he wishes to acknowledge his indebtedness to Dr. Zyuiti Kuwana in allowing the loan of Yokoyama's type specimens of his laboratory, and he is further indebted to Messrs. Shizuo Kato, Mitsuo Obi, Gorô Ishii, Yoshimasa Hasegawa and Norizumi Shinkaji, and other gentlemen who kindly helped him in collecting material. Thanks are also due to Prof. Teiso Esaki, Dr. H. B. Boudreaux, Messrs. Jinhaku Minami-kawa, Kyukichi Kishida and Haruo Takashima for their valuable suggestions.

## Family TETRANYCHIDAE

### Genus *Panonychus* Yokoyama

*Panonychus* Kishida : Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 531, 1929. Genotype : *Panonychus mori* Yokoyama, 1929 (monobasic) = *Tetranychus citri* McGregor, 1916.

1) Contribution No. 367 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Aided by a grant from the Scientific Research Fund of the Hokkaido Prefectural Office (1956).

*Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 12, 1956.*

*Metatetranychus* Oudemans, Ent. Ber., 8: 199, 1931. Genotype: *Tetranychus ulmi* Koch, 1836; by original designation. **n. syn.**

Yokoyama gave only the description of *P. mori*, without the diagnosis of the genus *Panonychus*, but *Panonychus* is a valid name, in accordance with the International Rules of Zoological Nomenclature.<sup>1)</sup>

Recently, Pritchard and Baker (1955) considered the genus *Panonychus* to be a synonym of *Oligonychus* (= *Paratetranychus*). However, as is confirmed here, *Panonychus* has the priority over *Metatetranychus*.<sup>2)</sup>

***Panonychus citri* (McGregor), n. comb.**

*Tetranychus citri* McGregor, Ann. Ent. Soc. Amer., 9: 286, pl. 14, figs. 1-9, 1916.

*Panonychus mori* Kishida: Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 531, figs. 243, 244, 1929 (♀ ♂, on mulberry); ———, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 311, figs. 114, 115, 1933; Yokoyama & Ishii, Bull. Imp. Seric. Exp. Sta., 8: 425, pl. 32, 1934; Zacher, Handb. Pflanzenkrankh., Bd. 4, Lief. 1, 5 Aufl., p. 164, 1950. **n. syn.**

*Panonychus mori* Kishida (nomen nudum): Hujiyama, Sakura-kai Zasshi, No. 22, p. 85, 1927.

*Oligonychus mori*, Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 341, 1955.

*Metatetranychus citri*, Reck, Soobsh. Akad. Nauk Gruz., S. S. R., 2(9), p. 832, 1941; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 133, figs. 96-99, 1955; Ehara, Annot. Zool. Jap., 28: 180, figs. 9-11, 1955.

On the present species the author recently gave a rather detailed note under the name of *Metatetranychus citri*. The syntypes of *Panonychus mori* Yokoyama<sup>3)</sup> have been available for the present study. After examination, it has been clear that *Panonychus mori* is synonymous with *Metatetranychus citri*.

The mite is here recorded firstly from Hokkaido. On the eggs from Hokkaido the gey fibrils are generally absent.

*Specimens examined.* Together with the syntypes of *mori*, additional specimens labelled by Yokoyama as *mori* have been studied. Furthermore, the following collections from mulberry have been studied: *Hokkaido*: Sapporo, 3 ♂♂ & 10 ♀♀, 21. VIII, 1953, 25 ♀♀, 12. VIII, 1954, 3 ♂♂ & 30 ♀♀, 3. VII, 1956, S. Ehara leg.; *Honshu*: Iizaka, Fukushima Pref., 4 ♀♀, 10. X, 1955,

1) Article 25: An Unofficial Interpretation of the International Rules of Zoological Nomenclature as amended by the XIII International Congress of Zoology, Paris, 1948, and by the XIV International Congress of Zoology, Copenhagen, 1953 (by W. I. Follett, 1955), p. 26, (138), A & B, p. 33, (169).

2) Accordingly, the name of European red mite, *Metatetranychus ulmi* (Koch), should be changed:

*Panonychus ulmi* (Koch), **n. comb.**

3) As is pointed out by Pritchard and Baker (1955) the name *Panonychus mori* is validated by Yokoyama, who first published the description of *mori*. Although Yokoyama as well as a number of other Japanese writers credited this species to Kishida, no description of *mori* by Kishida has been published.

S. Ehara leg.; Maébashî, Gumma Pref., 5 ♀♀, 5. X, 1955, 10 ♀♀, 6. X, 1955 (staffs of the Gumma Pref. Sericult. Exp. Sta.); Sôja, Gumma Pref., 10 ♀♀, 6. X, 1955 (staffs of the Gumma Pref. Sericult. Exp. Sta.); Shibukawa, Gumma Pref., 1 ♀, 15. X, 1955, S. Ehara leg.; Manriki, Yamanashi, Yamanashi Pref., 1 ♀, 13. X, 1955, S. Ehara leg.; Kyushu; Kasugabarû, Fukuoka Pref., 3 ♂♂ & 10 ♀♀, 22. X, 1955, S. Ehara leg., 10 ♀♀, 26. X, 1955, M. Ono leg.

***Eotetranychus suginamensis* (Yokoyama)**

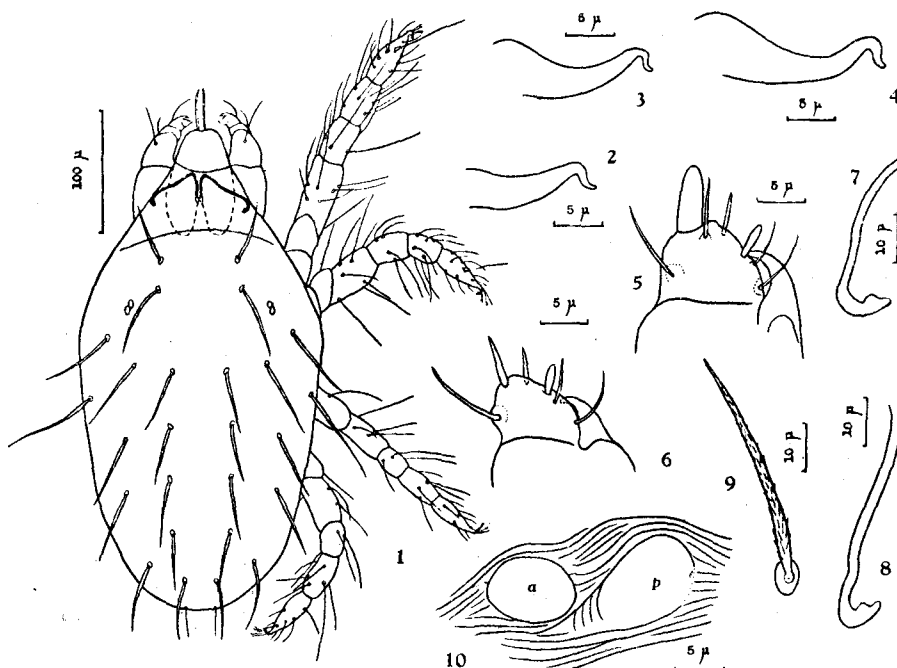
(Figs. 1-14)

*Tetranychus suginamensis* Yokoyama, Bull. Imp. Seric. Exp. Sta., 8: 231, pls. 23, 24, 1932 (♀ ♂, on mulberry).

*Tetranychus* sp., Yokoyama, New Textb. Sericult. Ins. Pests (Saishin Nippon Sangyô Gaichû Zensho), p. 538, fig. 247, 1929; Suematsu & Yokoyama, Textb. Mulberry Pests (Sôju Byôgaichû Ron), p. 180, fig. 65, 1930.

*Tetranychus Suginamensis* (!), Yokoyama, Vadem. Sericult. Ins. Pests (Jitsuyô Sangyô Gaichû Hen), p. 315, figs. 116, 117, 1933.

*Eotetranychus suginamensis*, Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 200, 1955.



Figs. 1-10. *Eotetranychus suginamensis*. 1. Dorsal view of female. 2-4. Aedeagus. 5. Distal part of palpus of female. 6. Distal part of palpus of male. 7-8. Peritreme of female, dorsal view. 9. Dorsal seta of female. 10. Eyes of female, left side; a, anterior eye, p, posterior eye.



*Female.* Body from above elliptical, 310 to 390  $\mu$  long and 190 to 230  $\mu$  wide in widest part. Colour pale greenish yellow. Distal segment of palpus wider than long; 5 additional setae present as usual; terminal sensillum more than two and one-half times as long as broad; dorsal sensillum rather spindle-shaped, distinctly shorter than terminal sensillum. Mandibular plate (ratio of length to breadth, 10:6.3), emarginate mediodistally. Relative lengths of segments in leg I as follows: Trochanter, 11; femur, 21; patella, 12; tibia, 12; tarsus (empodium exclusive), 16. Tarsus I dorsally provided with 2 proximate sets of duplex setae, 5 tactile setae borne proximad of proximal set of duplex setae; proximal duplex setae of tarsus I with proximal member about one-third as long as distal member; distal duplex setae of tarsus I with proximal member one-fifth to one-fourth as long as distal member; tibia I with 9 tactile and 1 sensory setae. Tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae; tibia II with 8 tactile setae. Empodia normally consisting of 3 pairs of hairs. Two eyes present on each side, anterior eye being smaller than posterior one. Peritreme rather slender, hooked distally and ending in unique form, as shown in Figs. 7-8. Dorsum of body with transverse striae not only between the inner sacral and inner lumbar setae, but also in the area between these setae. Dorsal setae not arising from tubercles, comparatively rapidly tapering, pubescent, and generally longer but sometimes shorter than longitudinal intervals between them. Genital flap generally with transverse striae; the area immediately anterior to the flap variable in striation individually, sometimes transversely striate, and sometimes irregularly striate.

*Male.* Body from above sagittate in outline, 210 to 250  $\mu$  long and 130 to 150  $\mu$  wide in widest part. Distal segment of palpus without terminal sensillum; dorsal sensillum spindle-shaped. Tarsus I with 4 tactile and 2 sensory setae posterior to duplex setae; tibia I with 9 tactile and 4 sensory setae. Tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae; tibia II with 8 tactile setae. The aedeagus is as given in Figs. 2-4: Shaft gradually tapering posteriorly and bent sharply ventrad in posterior portion to form the hook which is much shorter than shaft, and which is gradually narrowing and sigmoid.

*Specimens examined.* In this study the syntypes have been examined. These were collected at Suginami, Tokyo, and are composed of both sexes. Together with the types, the following specimens collected on mulberry, including topotype material, have been studied: *Hokkaido*; Maruyama, Sapporo, 2 ♂♂ & 4 ♀♀, 9. IX, 1955, S. Ehara leg.; *Honshu*; Yanagawa, Fukushima Pref., 2 ♀♀, 25. IX, 1955, O. Amano leg.; Iizaka, Fukushima Pref., 5 ♂♂ & 30 ♀♀, 10. X, 1955, S. Ehara leg.; Numata, Gumma Pref., 3 ♀♀, 15. X, 1955, S. Ehara leg.; Suginami, Tokyo, 1 ♂ & 2 ♀♀, 12. X, 1954, G. Ishii & S. Ehara leg.; Manriki, Yamanashi, Yamanashi Pref., 2 ♂♂ & 2 ♀♀, 13. X, 1955, S. Ehara leg.

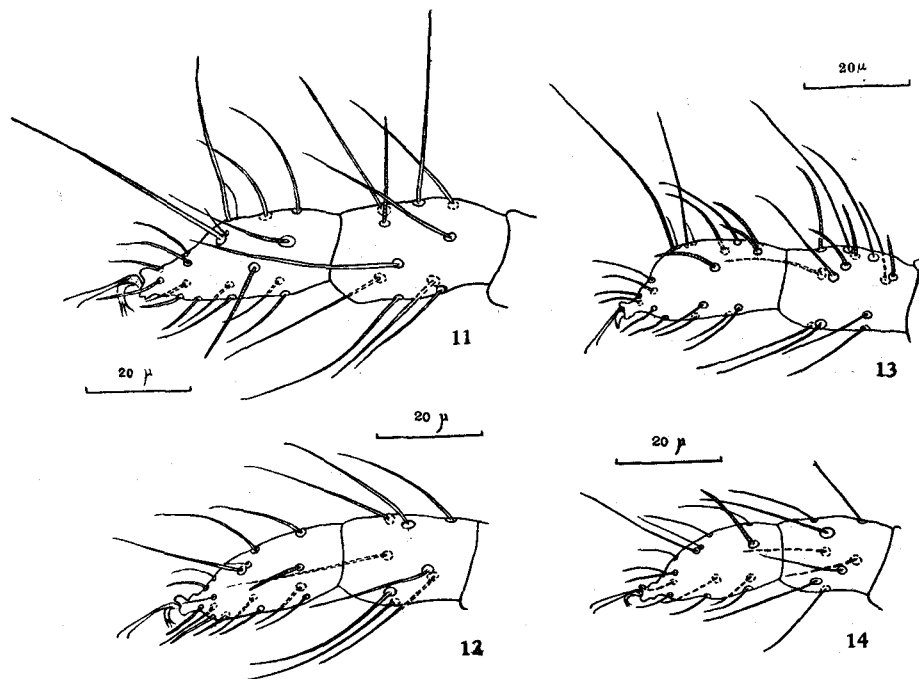
Specimens from *Quercus serrata* (new host) in Honshu have been forwarded

to the author by Mr. Naoshi Hikichi: Noda-mura, Fukushima Pref., 3 ♂♂ & 10 ♀♀, 10. VIII, 1955, N. Hikichi leg.

*Hosts.* Mulberry and *Quercus serrata*.

*Distribution.* Japan: Hokkaido (*new record*) and Honshu.

*Remarks.* The mite originally described as *Tetranychus suginamensis* was transferred by Pritchard and Baker (1955) into the genus *Eotetranychus*, their treatment being based on a few biological habits shown in Yokoyama's description. The present author is coincided with them.



Figs. 11-14. *Eotetranychus suginamensis*, chaetotaxy of leg. 11. Tibia and tarsus I of female. 12. Tibia and tarsus II of female. 13. Tibia and tarsus I of male. 14. Tibia and tarsus II of male.

This species closely resembles *Eotetranychus pallidus* (Garman, 1940) and *E. hicoriae* (McGregor, 1950) of U.S.A. in the structure of aedeagus, but its male palpus is deficient in terminal sensillum. Furthermore, this is characterized in the structure of peritreme. Pritchard and Baker (1955) are of opinion that *Eotetranychus mori* (Rahman and Sapra, 1940) of India is synonymous with *E. suginamensis*. But, *E. mori* is probably a distinct species, as the terminal sensillum of male palpus is well developed in *E. mori* (after original) but absent in *E. suginamensis*.

### Genus *Tacebia* Yokoyama

*Tacebia* Kishida : Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 536, 1929. Genotype: *Tacebia parva* Yokoyama, 1929; monobasic.

The genus *Tacebia* is validated by the description of the species, *T. parva*, though Yokoyama did not give the diagnosis of the genus. Pritchard and Baker (1955) considered the genus *Tacebia* to be a synonym of the genus *Oligonychus* (= *Paratetranychus*). The true status of *Tacebia* must remain in question before the genotype, *T. parva*, is critically studied.

### *Tacebia parva* Yokoyama

*Tacebia parva* Kishida : Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 536, 1929 (♀, on mulberry).

*Tacebia Parva* (!) Kishida (nomen nudum) : Huijiyama, Sakura-kai Zasshi, No. 22, p. 85, 1927.

*Oligonychus parva*, Pritchard & Baker, *Rev. Spider Mite Fam. Tetr.*, p. 341, 1955.

On this species, Pritchard and Baker (1955) stated as follows: "Yokoyama validated this species, even though it was credited to Kishida. No reference to publication of the name by Kishida has been found." The present author is of the same opinion with them.

Yokoyama's types were lost unfortunately. Two eggs of this species labelled by Yokoyama are preserved in the National Sericultural Experiment Station. These eggs, attaining about 160  $\mu$  in diameter, seem to belong to the Tetranychidae. The eggs are preserved in poor condition, so that it has been unable to observe whether they possess the dorsal stipe or not.

The mite was sought by the present author in the type locality (Fukushima Prefecture) in autumn of 1955, but was not succeeded. According to Yokoyama's description, females of *Tacebia parva* are bright red in colour, and their legs terminally bear two strong claws. The true status of this species is preserved for further study.

### *Tetranychus kanzawai* Kishida

(Figs. 15-25)

*Tetranychus kanzawai* Kishida, *Zool. Mag.*, 39 : 105, 1927 (♀ ♂, on mulberry); —, *Illustr. Encycl. Fauna Jap.*, p. 957, fig. 2724, 1947; anonymous, *Kanzawa Spider Mite & its Control* (Kanzawa-hadani to sono Bôjohô), p. 2, pls. 1, 2, 3, 1927; Yago, *Control Method Agr. Ins. Pests* (Zikken Gaichû Bôjohô), p. 375, fig. 166, 1935; Ishii, *Textb. Agr. Ent.*, p. 345, 1949; Pritchard & Baker, *Rev. Spider Mite Fam. Tetr.*, p. 431, 1955.

*Tetranychus kanzawai* (partim), Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 525, fig. 241, 1929.

*Tetranychus Kanzawai* (!) (partim), Suematsu & Yokoyama, *Textb. Mulberry Pests* (Sôju Byôgaichû Ron), p. 178, fig. 64, 1930; Yokoyama, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 307, figs. 111, 112, 1933.

*Tetranychus japonicus* Hotta, *Trans. Shizuoka-ken Agr. Assoc.*, 32: 10, 1928 (♀ ♂); Minamikawa, *Chagyô Gijutsu Kenkyû*, No. 3, p. 50, 1950; —, *Vadem. Tea Cult.* (Chagyô Hôten), p. 123, fig. 20, 1950. **n. syn.**

*Tetranychus japonica* (!), Sonan, *Ins. World*, 37: 263, 1933.

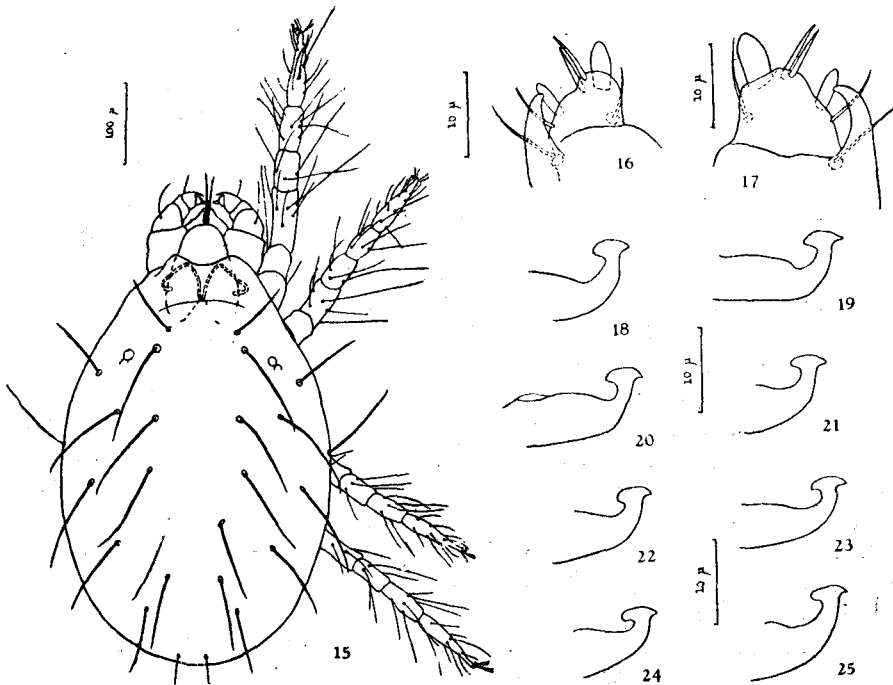
*Tetranychus* sp., Hotta, *Chaji-Shiken Tokubetsu Hôkoku*, No. 2, p. 2, pl. 1, 1917.

*Tetranychus telarius* (nec Linné), anonymous, *Ann. Rep. Shizuoka-ken Agr. Exp. Sta.*, 1918: 115, 1918; —, *Life History & Control Tea Spider Mite & Citrus Spider Mite* (Cha no Akadani to Mikan no Akadani tonô Keika-Shûsei narabini sono Kujohô; publ. by Shizuoka-ken Agr. Exp. Sta.), p. 1, pl. 1 (figs. 1-3), 1924; Esaki, *Myriapoda & Arachnida*, p. 74, 1932; Yago, *Control Method Agr. Ins. Pests* (Zikken Gaichû Bôjohô), p. 375, 1935.

*Tetoranychus* (!) *telarius* (nec Linné), Hotta, *Ins. Pests Tea Plant* (Chaju no Gaichû; mimeographed), p. 131, 2 figs., 1920.

*Tetranychust* (!) *clarius* (!), anonymous, *J. Plant. Protect.*, 12: 468, 1925.

This species was originally described based on specimens collected on mulberry in Yamanashi Prefecture. A number of specimens collected from type locality have been available for the present study.



Figs. 15-25. *Tetranychus kanzawai*. 15. Dorsal view of female. 16. Distal part of palpus of male. 17. Distal part of palpus of female. 18-25. Aedeagus (18-21, Yamanashi Pref., on mulberry; 22-25, Shizuoka Pref., on tea).

The mite is carmine red in colour. The female measures  $400\ \mu$  long and  $290\ \mu$  wide, while the male measures  $290\ \mu$  long and  $180\ \mu$  wide. The chaetotaxy of legs is as follows: Female; tarsus I with 4 tactile setae posterior to duplex setae, tibia I with 9 tactile and 1 sensory setae, tarsus II with 3 tactile and 1 sensory setae proximal to duplex setae, tibia II with 7 tactile setae; male; tarsus I with 4 tactile and 2 sensory setae proximal to duplex setae, tibia I with 9 tactile and 4 sensory setae, tarsus II with 3 tactile and 1 sensory setae posterior to duplex setae, tibia II with 7 tactile setae.

*T. kanzawai* closely resembles *T. telarius*, but is different from the latter in the structure of aedeagus. The aedeagal barb of the former is much larger than that of the latter, and is acutely angled posteriorly but rounded anteriorly. Furthermore, the dorsal integumentary folds of the female bear semi-circular to triangularly rounded lobes, showing the type of *T. cinnabarinus* and *T. lobosus*, rather than that of *T. telarius* and *T. atlanticus* (Boudreaux, 1956).

Collating the present species, topotype material of *T. japonicus* Hotta, 1928, which was originally described from Kanaya, Shizuoka Pref., on tea, has been studied. Consequently, it has been clear that *T. japonicus* is a synonym of *T. kanzawai*. A mite recently recorded from apple in Shizuoka Prefecture under the name of *T. atlanticus* (Shinkaji, 1954, Pritchard & Baker, 1955) seems probably to be identical with the mite here treated.

*Specimens examined.* The following specimens collected on mulberry have been studied: *Hokkaido*; Maruyama, Sapporo, 1 ♂, 20. IX, 1955, S. Ehara leg.; *Honshu*; Iizaka, Fukushima Pref., 3 ♂♂ & 5 ♀♀, 10. X, 1955, S. Ehara leg.; Suginami, Tokyo, 1 ♂ & 6 ♀♀, VI, 1956, 3 ♂♂ & 5 ♀♀, VII, 1956, G. Ishii leg.; Shiozaki, Yamanashi Pref., 1 ♂ & 5 ♀♀, 13. X, 1955, S. Ehara leg.; Manriki, Yamanashi Pref., 5 ♂♂ & 15 ♀♀, 13. X, 1955, S. Ehara leg., 1 ♂ & 13 ♀♀, 18. XI, 1955, T. Tsuchiya leg.

Collections from other hosts in Honshu are as follows: Kuroishi, Aomori Pref., 5 ♂♂ & 3 ♀♀ (on pseudacacia), 25. VIII, 1954, S. Ehara leg.; Nirazaki, Yamanashi Pref., 4 ♂♂ & 15 ♀♀ (on hop), 13. X, 1955, S. Kato & S. Ehara leg.; Kanaya, Shizuoka Pref., 10 ♂♂ & 30 ♀♀ (on tea), 25. X, 1954, J. Minamikawa & M. Osakabe leg., 6 ♂♂ & 12 ♀♀ (on tea), XI, 1955, M. Osakabe leg., 3 ♀♀ (on tea), 14. X, 1954, S. Ehara leg.; Tsudaka-mura, Okayama Pref., 2 ♂♂ & 9 ♀♀ (on grape in greenhouse), 2. IX, 1955, S. Yabuki leg.; Nagaoka, Okayama, 4 ♂♂ & 6 ♀♀ (on pear), 2. IX, 1955, S. Yabuki leg.; Nagao-machi, Okayama Pref., 1 ♂ & 2 ♀♀ (on peach), 2. VIII, 1955, S. Yabuki leg.

*Hosts.* Hosts authentically recorded from Japan are mulberry, tea, hop, grape, pseudacacia, pear, peach and apple. This species is found predominantly on mulberry trees in Yamanashi Prefecture. It is a serious pest of tea in eastern part of Shizuoka Prefecture.

Hotta (1928) enumerated various kinds of host plants of *T. japonicus*. The present author, however, is doubtful about the fact that Hotta treated only speci-

mens belonging to the single species. In short, the author is inclined to consider that the tea is only authentic among the hosts listed by Hotta.

*Distribution.* Japan: Hokkaido (*new record*) and Honshu.

### ***Tetranychus telarius* (Linné)**

(Figs. 26-27)

*Acarus telarius* Linné, Syst. Nat., Ed. 10, p. 616, 1758.

*Tetranychus telarius*, Dugés, Ann. Sci. Nat. Paris (sér. 2), 1: 15, 1834; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 433, figs. 386-391, pl. 1, 1955; Ehara, J. Fac. Sci. Hokkaido Univ., Ser. VI, Zool., 12: 249, figs. 11-15, 1956.

*Tetranychus lintelarius* (!), Kishida, Illustr. Encycl. Fauna Jap., 1st Ed., p. 977, fig. 1818, 1927; ———, Ibid., Rev. Ed., p. 957, fig. 2723, 1947.

The author described the species rather in detail in his previous report (1956). A number of specimens from mulberry in Hokkaido and Honshu (Gumma Pref. and Ibaragi Pref.) have been studied. Specimens from the hop (belonging to the Moraceae as well as mulberry) in Hokkaido and Honshu (Yamagata Pref.) have been also studied.

### ***Tetranychus truncatus* n. sp.**

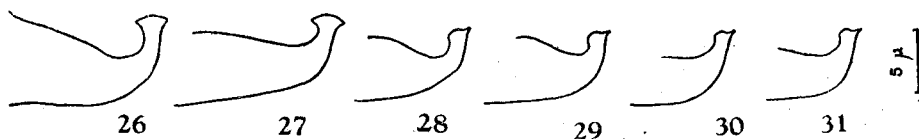
(Figs. 28-31)

*Tetranychus kanzawai* (partim; nec Kishida), Yokoyama, *New Textb. Sericult. Ins. Pests* (Saishin Nippon Sangyô Gaichû Zensho), p. 525, fig. 241, 1929.

*Tetranychus Kanzawai* (!) (partim; nec Kishida), Suematsu & Yokoyama, *Textb. Mulberry Pests* (Sôju Byôgaichû Ron), p. 178, fig. 64, 1930; Yokoyama, *Vadem. Sericult. Ins. Pests* (Jitsuyô Sangyô Gaichû Hen), p. 307, figs. 111, 112, 1933.

The present mite is carmine in colour. The female measures 400  $\mu$  long and 290  $\mu$  wide, while the male measures 290  $\mu$  long and 180  $\mu$  wide.

This species belongs to the *telarius* complex, and is generally in accordance in structure with the members belonging to the complex, but is different from the rest in the aedeagus with a tiny barb, of which the hook is apparently truncated. The barb is acutely angled posteriorly but rounded anteriorly, the axis of the barb forming a small angle with the shaft.



Figs. 26-27. Aedeagus of *Tetranychus telarius*. Figs. 28-31. Aedeagus of *Tetranychus truncatus* n. sp.

The dorsal integumentary folds of the female bear semi-oblong to semicircular lobes, showing the type of *T. telarius*, rather than that of *T. cinnabarinus* and

*T. lobosus* (Boudreaux, 1956).

The mites described by Yokoyama under the name of *T. kanzawai* seem partly to belong to the new species. Because, his studies were chiefly based on specimens from Suginami, Tokyo, where both *kanzawai* and the closely related species occur on the mulberry.

Holotype. ♂, Suginami, Tokyo, 12. X, 1954 (on mulberry), G. Ishii & S. Ehara leg.

Allotype. ♀, same data as holotype.

Paratypes. 5 ♂♂ & 7 ♀♀, same data as holotype.

The types are preserved in the Zoological Institute, Faculty of Science, Hokkaido University.

Several specimens from Shibukawa, Gumma Pref., on mulberry, seem to be identical with the new species, though the specimens are few in number.

*Host and distribution.* Japan: Honshu, on mulberry.

#### Family PHYTOPTIPALPIDAE

##### *Brevipalpus inornatus* (Banks)

(Fig. 32)

*Tenuipalpus inornatus* Banks, Proc. Ent. Soc. Wash., 14: 97, pl. 1, fig. 1, 1912.

*Brevipalpus inornatus*, Baker, Proc. Ent. Soc. Wash., 47: 33, 1945; ———, Amer. Midl. Nat., 42: 358, pl. 2, figs. 11–15, 1949; McGregor, Mem. S. Calif. Acad. Sci., 3: 13, fig. 4, pl. 2, 1949; Pritchard & Baker, Univ. Calif. Publ. Ent., 9: 36, fig. 37, 1952; Minamikawa, Cha, 8 (1): 27, 1955.

? *Tenuipalpus californicus*? (nec Banks), Hotta, Ins. Pests Tea Plant (Chaju no Gaichû; mimeographed), p. 136, 1 fig., 1920.

? *Tenuipalpus* sp., Sonan, Ins. World, 37: 263, 1933.

*Female.* Body from above ovate-sagittate, about 250  $\mu$  long (including rostral shield), widest (160  $\mu$ ) at suture between propodosoma and hysterosoma. Colour scarlet. Rostrum about reaching the middle of femur I. Palpus slightly surpassing the rostrum, with two setae and a peg on the distal segment. Mandibular plate sagittate anteriorly. Tarsi I and II each with a rodlike seta; femora I and II each with a broad, serrate dorsal seta. Peritreme ending in a swollen chamber. Rostral shield with three pairs of lobes, deeply cleft between two median lobes. Dorsum of both propodosoma and hysterosoma with weak, apparently inconspicuous, irregular striae medially, though considerably variable interspecifically, and with rather even reticulations mediolaterally; elements of the reticulate pattern generally polygonal. Hysterosomal pores rather inconspicuous. All dorsal setae short; dorsolateral hysterosomal setae five-paired, serrate, last three pairs comparatively well developed; dorsocentral hysterosomal setae three-paired, minute. Venter of body mostly with small reticulations. Anterior medioventral metapodosomal pair much shorter than posterior pair, the latter reaching to the suture between propodosoma and hysterosoma.

*Male.* Body from above sagittate, about  $230\ \mu$  long (including rostral shield) and  $150\ \mu$  wide. Generally similar to female. Tarsi I and II with a rodlike seta respectively. The dorsal integument is different from the female in the following points: Anterior part of hysterosoma inconspicuously reticulate medially, posterior part of hysterosoma reticulate in both median and mediolateral portions.

*Deutonymph.* Body subequal in size to male. The dorsal propodosomal, humeral, and dorsolateral hysterosomal setae are all observable to be serrate. Second and third pairs of dorsal propodosomals broad and large, last three pairs of dorsolateral hysterosomals similar to these setae; dorsocentral hysterosomals minute.

*Specimens examined.* Honshu: Iizaka, Fukushima Pref., 4 ♂♂, 13 ♀♀ & 2 nymphs (on mulberry), 10. X, 1955, S. Ehara leg., 3 ♀♀ & 1 nymph (on *Erigeron* sp.), 13. V, 1955, N. Hikichi leg.; Shibukawa, Gumma Pref., 5 ♀♀ (on mulberry), 15. X, 1955, S. Ehara leg.; Matsudo, Chiba Pref., 10 ♀♀ & 1 nymph (on tea), 31. X, 1955, S. Ehara leg.; Shimizu, Shizuoka Pref., 5 ♀♀ & 1 nymph (bred in Labor., Ihara Noyaku Co., Ltd., furnished by Y. Hasegawa; natural and laboratorial host, tea), III, 1955 (this date: taken from culture and fixed). Kyushu: Kagoshima, 3 ♀♀ & 2 nymphs (on tea), 26. X, 1955, S. Ehara & H. Maehara leg.

*Hosts.* Tea, mulberry, *Erigeron* sp., *Pittosporum*, and tulip bulbs are known as hosts of the mite in Japan. Records from the last two hosts were made in U.S.A., and the recorded specimens were imported from Japan after American authors (Baker, 1949, Pritchard & Baker, 1952). From U.S.A. and other countries various kinds of host plants, mostly ornamental plants, were recorded.

*Distribution.* Japan (Honshu; Kyushu, *new record*); Argentina, Australia,

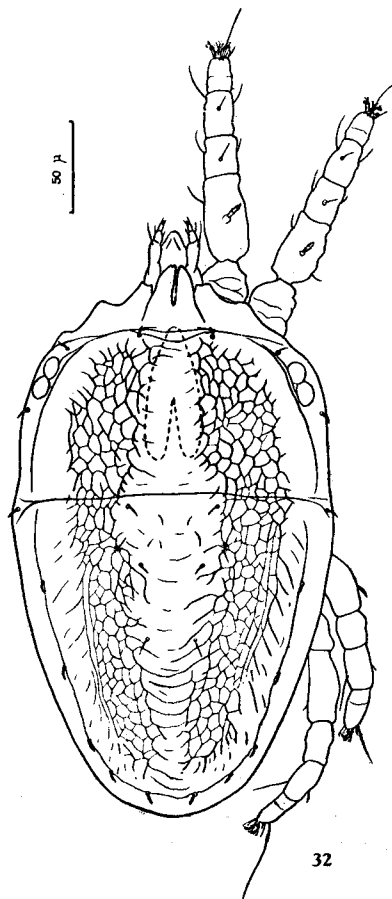


Fig. 32. *Brevipalpus inornatus*, dorsal view of female.



Canada, Ceylon?, Italy (at U.S.A. port), U.S.A., Venezuela.

*Remarks.* A false spider mite which was reported twice at least to infest Japanese tea-plants, is perhaps the present species (cf. synonymic list shown above). The authentic record from tea of Japan was first made by Minamikawa (1955). The mite has been recognized to be parasitic on mulberry as well as on tea in Japan, both of them being of economic importance in this country.

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